Year 12 Science: Investigating cells under the light microscope

Name: _____ Date: _____

Try these without your notes first, then check the answer key.

Practice

1. What is the total magnification with a ×10 eyepiece and a ×10 objective?

2. The field of view at ×100 is 1.8 mm. What is it at ×400, in µm?

3. Six cells fit across a 1.8 mm field of view. How long is one cell, in µm?

4. A 50 µm guard cell is drawn 75 mm long. What is the magnification of the drawing?

5. A drawing at ×2000 needs a 10 µm scale bar. How long should the bar be, in mm?

6. Name the convention error: the student labelled each organelle with an arrow drawn freehand that crossed another label line.

7. Your onion epidermis slide shows no chloroplasts. Write an Achieved annotation linking this to where the tissue grows.

8. Write a Merit annotation explaining how the contractile vacuoles help Paramecium survive in pond water.

9. A drawing of Elodea cells has gaps between the cells and no chloroplasts drawn. Is each a convention error or a representation error?

Fix the mistake

10. Correct this statement: "I shaded the chloroplasts in green so they stand out."

11. Correct this statement: "I focused at ×400 using the coarse focus knob."

12. Correct this statement: "The field of view is 4.0 mm at ×40, so it is 40 mm at ×400."

13. Correct this statement: "I drew the cell with mitochondria and ribosomes because textbook cells have them."

Answer key (for parents and tutors)

1. What is the total magnification with a ×10 eyepiece and a ×10 objective?
   10 × 10 = ×100.
2. The field of view at ×100 is 1.8 mm. What is it at ×400, in µm?
   ×400 is 4 times ×100, so 1.8 ÷ 4 = 0.45 mm = 450 µm.
3. Six cells fit across a 1.8 mm field of view. How long is one cell, in µm?
   1.8 mm = 1800 µm; 1800 ÷ 6 = 300 µm.
4. A 50 µm guard cell is drawn 75 mm long. What is the magnification of the drawing?
   75 mm = 75 000 µm; 75 000 ÷ 50 = ×1500.
5. A drawing at ×2000 needs a 10 µm scale bar. How long should the bar be, in mm?
   10 µm × 2000 = 20 000 µm = 20 mm.
6. Name the convention error: the student labelled each organelle with an arrow drawn freehand that crossed another label line.
   Label lines must be ruled lines (not arrows), must not cross each other, and should end exactly on the part.
7. Your onion epidermis slide shows no chloroplasts. Write an Achieved annotation linking this to where the tissue grows.
   Onion bulb epidermis cells have no chloroplasts because the bulb grows underground, where there is no light for photosynthesis.
8. Write a Merit annotation explaining how the contractile vacuoles help Paramecium survive in pond water.
   Pond water is more dilute than the Paramecium's cytoplasm, so water keeps moving into the cell by osmosis. The contractile vacuoles collect this extra water and squeeze it out through the membrane, so the cell does not swell and burst, and its cytoplasm stays at the right concentration for its reactions.
9. A drawing of Elodea cells has gaps between the cells and no chloroplasts drawn. Is each a convention error or a representation error?
   The gaps are a convention error: cells in a tissue are drawn touching, sharing their walls. Leaving out the chloroplasts is a representation error: they are typical organelles of Elodea cells and show clearly at ×400, so the drawing is no longer an accurate record.
10. Correct this statement: "I shaded the chloroplasts in green so they stand out."
    Biological drawings use pencil outlines only; shading or colouring is a convention error.
11. Correct this statement: "I focused at ×400 using the coarse focus knob."
    At high power use only the fine focus; the coarse focus can push the objective into the slide and crack it.
12. Correct this statement: "The field of view is 4.0 mm at ×40, so it is 40 mm at ×400."
    More magnification shows a smaller area: ×400 is ten times ×40, so the field is 4.0 ÷ 10 = 0.40 mm.
13. Correct this statement: "I drew the cell with mitochondria and ribosomes because textbook cells have them."
    Draw only what your own slide shows at that magnification; electron microscope detail is a representation error.